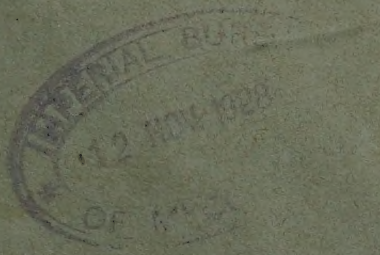
Reprinted from the Journal of the Indian Botanical Society,
Vol. VI, Nos. 3 & 4 1927, pp. 109—112.



ANNUAL PARTIAL WILTING IN HIBISCUS TILIACEUS.

By H. Chaudhuri,

Department of Botany, Panjab University, Lahore.

METHODIST PUBLISHING HOUSE, MADRAS—1928.

ANNUAL PARTIAL WILTING IN HIBISCUS TILIACEUS.

By H. Chaudhuri,

Department of Botany, Panjab University, Lahore.

In certain plants of *Hibiscus tiliaceus* in the Lawrence Gardens, Lahore, the writer observed wilting of newly formed twigs during spring and early summer for several years in succession.

The young buds and leaves became flaccid and in extreme cases the young branches also withered and dried up. Otherwise late in the season these very branches again developed healthy leaves and buds. This wilting is found to be a very slow process and it generally takes a week or more for a leaf to droop down fully.

This partial wilting has been found to be due to an attack of a fungus, which normally remains within the host tissue but in many cases it appears on the leaf surface forming spots. These spots are somewhat circular in shape and are visible on both surfaces of the leaf. Sometimes the spots become perforated. When a number of these spots grow together, portions of leaves may dry up and fall down (see figure). These are characteristic *Alternaria* spots. Pale brownish, circular spots, scattered irregularly over the leaves, showing narrow concentric dark lines. These are seen only on the older leaves immediately below the leaves which droop down, but they themselves do not become flaccid. From the wilted twigs a species of *Alternaria* has been isolated and has been found to be identical with the *Alternaria* from the leaf spots. On the surface of the wilted leaves and buds no spores or mycelia are seen. Fungal hyphæ could be seen in transverse sections of the wilted twigs and when such twigs were slit open and put inside the Roux tube, typical *Alternaria* spores were formed in 10–15 days' time.

Though many species of *Alternaria* occur as saprophytes and come in as secondary infections, this species which has been identified as *Alternaria Dianthi* (7) occurs as a parasite and has been found to cause enormous loss in *Jasminum* and Marigold beds in Lahore. In some years it becomes impossible to get any flower in some nurseries. *Alternaria Dianthi* on *Jasminum* and Marigold has been investigated by Mr. Gyan Singh, one of my old students, and has been shown to be parasitic (5). The pathogenicity of *Alternaria* (*A. Solani*,) was proved by Chester and Galloway (4) by successful inoculations on tomato and potato. Dorsett (3) with *Alternaria violae* showed parasitism of the fungus by inoculations with

spores on living leaves in distilled water. In India, pathogenicity of different species of *Alternaria* has been recorded by Butler (1). Though the species occurring on *Hibiscus tiliaceus* and *Jasminum* are morphologically similar, they differ considerably in their physiological behaviour. The *Alternaria* from *Jasminum* and Marigold were always intercrossible, but not so with the one from *Hibiscus*. The *Alternaria* from *Hibiscus* would always infect the Jasminum and the Marigold, but the *Alternaria* from the *Jasminum* and the Marigold could never infect *Hibiscus*. Out of a large number of inoculations made only two cases of doubtful infections were obtained.

The fungus on *Hibiscus tiliaceus* is a facultative saprophyte. It grew readily in culture on a variety of media, but then it lost its virility. No successful inoculation could be made even from a culture of F1 generation, though it readily infected *Jasminum* and Marigold buds and produced the characteristic withering of the buds. The spores obtained in nature from the diseased plants germinated readily in water and produced short chains of conidia. Artificial inoculations were made with spores obtained from the leaf spots. For this, drops of spore suspensions in distilled water were placed on the upper as well as on the under surfaces of the leaves on small twigs placed in small flasks containing normal culture solution. Also in another set prick inoculations were made when the surface of the leaf was pricked with a sterilised needle before the drop of spore suspension was placed. In both sets of experiments the leaves were placed in humid atmosphere. A large number of inoculations were made. From second day onwards bits of leaves containing the inoculated spots were fixed and sections made to find out how the germ tubes entered the tissues of the leaves. The prick inoculations whether made on the young or old leaves succeeded, for the germ tubes were able to enter the tissues of the leaves. Without the prick the germ tubes could penetrate the young leaves and buds only. When spore suspensions were placed on the under surface, the germ tubes entered mostly through the stomata. In older leaves the germ tubes failed to penetrate the thick cuticle but once it got inside the tissue of the leaf, it could rupture the epidermis, however thick. In *Alternaria Solani*, the conidiospores also come out by rupturing the epidermis (6).

A large number of sections have been cut to see if the partial wilting was due to the choking up of the vessels by the hyphae of the fungus. Though the mycelium was present in many cases, nowhere was it present in a sufficient quantity to block the passage of water.

The effect of the staling substances in producing wilts was next investigated. For this purpose the fungus was grown in a synthetic solution according to Coons (2); 25 cc. of the synthetic solution was

placed in a 250 cc. flask, and inoculated with a loopful of spore suspension. A large number of flasks was inoculated and incubated at 25° C. It was found that the fungus produced a large amount of alkaline substances. In 12 days the liquid changed from pH. 4.5 to pH. 7.0. The contents of the flasks were now filtered through clay filters and healthy young twigs were placed in the filtrate. Control plants were placed in Coon's solution. The twigs in the filtrate showed wilting in 2 to 3 days, but control plants remained quite healthy.

It seems therefore that the partial wilting is due to the alkaline secretion produced by the fungus.

The growth and infection of this fungus is determined mainly by the temperature and also perhaps humidity. It has been mentioned at the biginning of the paper that the partial wilting was found in spring and early summer only. The twigs and leaves produced in late summer never suffered from wilting. This naturally suggests a low thermal death point. It was actually found that few spores could withstand a temperature over 42° C for ten minutes. The summer temperature in Lahore being very high, the fungus cannot withstand it and is checked. In the case of potato blight caused by *Alternaria Solani*, it has been shown that the mycelium may reach the tuber and there hibernate. Here also it seems not improbable that the fungus similarly hibernates deep down in the tissue of the host plant. In view of the fact that spores of *Alternaria Dianthi* from other hosts do not infect *Hibiscus tiliaceus* and even spores from *Hibiscus* itself when grown in culture fail to reinfect, the suggestion of hibernation inside the host tissue seems a feasible one. But until the mycelium could be located inside the host tissue in other seasons nothing could be said definitely.

LAHORE,
25th January, 1927.

Summary

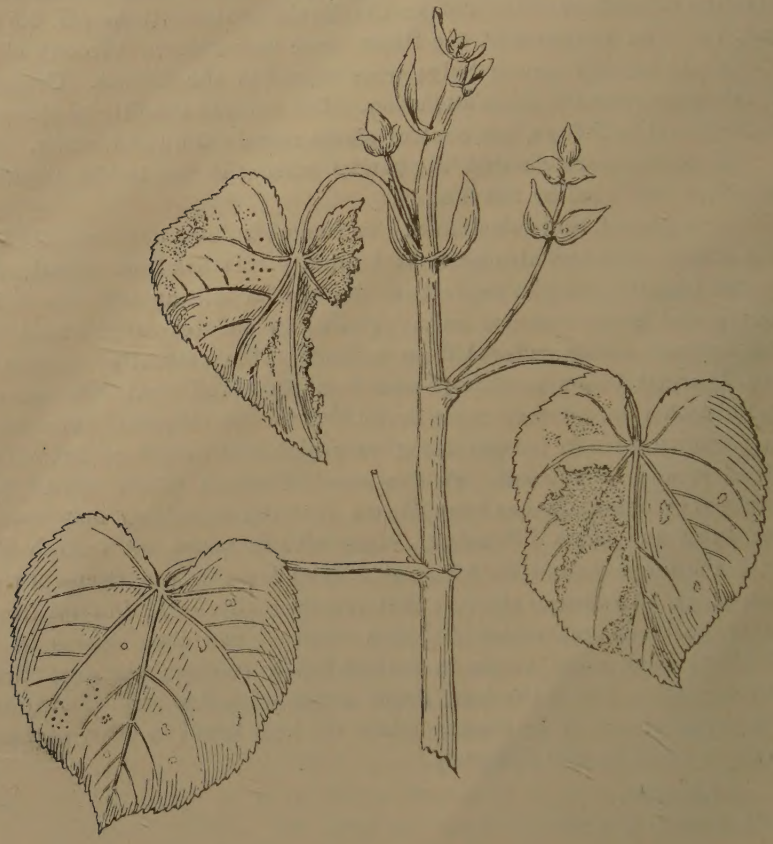
In certain plants of *Hibiscus tiliaceus* partial wilting was observed for several years in succession.

It has been found to be due to an attack of *Alternaria Dianthi*. This also causes bud rot in other plants of Lahore.

Though morphologically these are similar, the one on *Hibiscus* differs considerably physiologically from others. No spores from others hosts could infect *Hibiscus*, though the spores from *Hibiscus* infect others readily.

The fungus when growing produces a lot of alkaline staling substances and it has been shown that the actual wilting is due to this alkaline secretion and not due to the clogging of the vessels by the hyphae.

It has been suggested that the fungus hibernates inside the host tissue during the unfavourable period.



Literature

1. BUTLER, E. J.—Fungi and Disease in plants. *Calcutta*, 1918.
2. COONS, G. H.—Factors involved in growth and pycnidium formation of *Plenodomus rufo-maculans*. Journ. Agric. Res. Vol. v.p, 713, 1916.
3. DORSETT.—Bull: Division of Vegetable Psysiology and Pathology U. S. Depot. Agric. 23: 1900.
4. GALLOWAY.—Agric. Science, 7: 1893.
5. GYAN SINGH.—Bud rot in *Jasminum* and Marigold. To be shortly published.
6. STEVENS.—The fungi which cause plant disease. *New York*. 1913.
7. STEVENS AND HALL.—Carnation Alternariose Bot. Gaz. 47, 1909.

METHODIST PUBLISHING HOUSE, MADRAS.